Before drawing any comparison between these two systems it will be just as well to describe how each has been carried out

The Messrs. Siemens have applied to their (No. 1) district six powerful lights, fixed at a height of 80 feet from the street level upon tall latticed iron masts similar to those which are used on many railways for signalling purposes. They have also twenty-eight smaller lights, carried upon special iron posts, considerably higher than the ordinary lamp-posts, being 20 feet from the pavement. The powerful lights, fixed high up in air, are used more for the illumination of open spaces, and this system—a special feature of Dr. Siemens'—has been very extensively adopted at the Albert Docks, Blackpool, and other places. The central station of the Siemens system is in Old Swan Lane. Here three engines, supplied by Messrs. Marshall of Gainsborough, of their semi-portable type, and of 10-horse power each, fitted with an admirable automatic expansion gear (Hartnell's) specially applicable to engines used for electric lighting purposes, are fixed. Two of these engines are always at work during the time of lighting, but one is kept in reserve, ready at a moment's notice to replace either that may fail. These engines, by means of beltings and a counter-shaft, apply their power to various dynamo-machines of the well-known Siemens type. Each of the high lights is worked by a separate and distinct dynamo-machine, with which it is connected by separate conducting-wires. The wires throughout the whole of the City are of thick copper, very well insulated, and laid under ground after the customary manner of laying down wires for telegraphic purposes. The smaller lights are worked by alternating currents on the system with which we are familiar on the Thames Embankment applied to the Jablochkoff candle. In Swan Lane there are two alternating current machines each working two circuits of seven lights each, the lamps being arranged so that consecutive lamps are not in the same circuit, and by that means, if any accident should occur to one set of lamps it would only extinguish one out of two lights in a street, and not throw the whole district into darkness, which would be the case if all the lights were worked on one circuit. The field-magnets in all the large dynamo-machines are excited by a similar dynamo-machine, while the magnets of the alternating current machines are fed by currents from a smaller continuous dynamo-machine. Each large machine absorbs between 4- and 5-horse power, but the alternating machines require much less. The furthest light from the generating centre —Old Swan Lane—is that in front of the Guildhall, which is nearly three quarters of a mile distant, involving a length of wire of 2500 yards (a return wire being used), whose total resistance does not exceed one Siemens' unit. The illuminating power of the high lights is estimated to be 6000 candles, but it is well known that this estimate of the illuminating power of an electric light is a very wild one. There is no doubt that the lights are very powerful, and a stream of brilliant illumination is thrown all over such an area as that in front of the Royal Exchange. The Siemens' lamps burn for eighteen consecutive hours, owing to the size and length of the carbons used. They are provided with reflectors which throw a bright cone of light down in a very peculiar way, giving to this experiment a very marked feature.

There is no doubt whatever that where it is required to illuminate a large area this is very much more efficiently and economically done by using one single powerful light high up in air, than by distributing several smaller lights over the surface. In the former case the light is more evenly, uniformly, and perfectly diffused, in fact it acquires the character of bright moonlight, while in the latter case the light is distributed in patches of intensity and darkness over the whole space.

When streets are dealt with the conditions are different, and it is here quite easy to show that economy and efficiency are provided for by properly distributing smaller lights along the street. The Messrs. Siemens have set to work to solve this problem in a scientific way, and Mr. Alexander Siemens, under whose control and management the system has been carried out, can show mathematically that to distribute light uniformly and properly a certain definite proportion should exist between the height of the posts and the distance at which they are apart. That this has been carried out is abundantly evident by the very even way in which light is distributed along Queen Street, King William Street, and Cheapside. Indeed it is difficult to see any break in the intensity of the light along the route—a proof that the practical application of the law very nearly approaches its theoretical limit. The theoretical point to be aimed at is that the height of the poles should be to half the distance between them as 1 is to the square root of 2. This has not been absolutely obtained, but a very close approach to it. The small lights only give an illuminating power, according to Messrs. Siemens, of 300 candles, and this probably is well within the mark. Comparisons between lights of low intensity are very easily and accurately measured; it is only when a power equal to thousands of candles is arrived at that the failure of comparison with a standard candle becomes evident.

The high lights have not been burning uniformly with that steadiness that success demands. Instances of failure are not numerous, though they have been frequent. The smaller lights, on the other hand, have worked more uniformly, and have given considerable satisfaction. The strong shadows thrown by the high lights have a very weird-like effect in certain positions, and the vibration of the lamp gives to the shadow of the pole that supports it an unsteadiness that has led the unwary to imagine in many instances that the pole itself was shaking. Could the shadows be removed from the effects of these high lights the effect would be very fine; as it is they detract enormously from the beauty of the lamps. The effect of the high lights to those standing below is excessively pleasing, and doubtless in warmer weather will be more highly appreciated than it has been during the past week. It is when crossing streets, and especially when crossing such a busy thoroughfare as that in front of the Mansion House that these lights show their efficiency to advantage. It is quite amusing to see how the *gamins* of London have taken advantage of the combination of electric lighting and asphalte road to convert the whole City into a gigantic skating-rink. Hundreds of boys are to be seen every night disporting themselves on their roller-skates.

(*To be continued.*)

WEATHER WARNINGS

IN a lecture on Solar Physics delivered at South Kensington on Friday last Prof. Balfour Stewart stated that he believed one great cause of weather changes to be solar variability in which we have periods of short length, as well as others extending over many years.

These weather changes, it is sufficiently well known, are propagated from west to east after they have once appeared.

Again there are variations in the diurnal declination range which may be said to constitute magnetic weather.

These are also caused by solar variability, and it is suspected that they are likewise propagated from west to east, although more quickly than the well-understood changes of meteorological weather.

It would thus appear to be at least possible that British magnetical weather of to-day may be followed by corresponding meteorological weather five or six days hence.

Prof. Stewart has made a preliminary trial, which induces him to think that this is the case, and that it

may ultimately be possible to forecast British meteorological weather by means of magnetic weather some five or six days previous to it.

BAROMETRIC GRADIENT AND WIND

I HAVE often felt surprised that the superiority in force of northerly and easterly as compared with southerly and westerly winds accompanying any given amount of barometric gradient has, at least until recently,[1] excited but little attention, seeing that the superiority in question is almost sufficient to suggest itself to any student of daily weather-charts. The comparison of anemometric records for the elucidation of this subject can only be imperfectly made, owing to the fact that there are very few situations at which an instrument can be erected which shall have a really equal exposure to winds from all points of the compass; neither is it possible, as I think, in comparing anemographic records from stations at our different coasts to eliminate the various effects of local inequalities of the earth's surface upon the force of the winds. There are two methods which can be employed in the investigation of this question, which seem to yield reliable, though necessarily somewhat rough and imperfect, results. One of these is to examine separately the anemographs of our imperfectly, but moderately well-exposed, inland stations, in relation to various values of barometric gradient in different directions. The other method is to discuss the means of estimated wind forces in relation to amount and direction of gradient for a large number of years and at a large number of stations. I have hitherto but partially and tentatively employed these two methods, but the results arrived at may possibly be of interest to some readers of NATURE. The mean wind velocities at Stonyhurst Observatory, obtained by me from the hourly readings published by the Meteorological Committee for the years 1874 to 1876 inclusive, for different moderate amounts of atmospheric gradient are as follows:—

Gradient per fifteen nautical miles.	Mean velocity in miles per hour of winds from points between S.S.E. and N.W. (inclusive).	Mean velocity in miles per hour of winds from points between N.N.W. and S.E. (inclusive).
·006	4·31	5·53
·009	5·90	6·82
·012	7·79	9·63
·015	11·09	13·97
·018	13·03	15·29

The mean wind velocities at Kew Observatory for the same period for similar gradients are as follows:—

Gradient per fifteen nautical miles.	Mean velocity in miles per hour of winds from points between S.S.E. and N.W. (inclusive).	Mean velocity in miles per hour of winds from points between N.N.W. and S.E. (inclusive).
·006	4·14	6·88
·009	6·41	8·63
·012	8·37	10·93
·015	11·21	14·27
·018	13·56	16·98

This shows that for any given (moderate) gradient winds from north and east points are stronger than those from south and west points at these stations. The second method, in which the estimated wind-forces have been employed, has been tried by me in the cases of twelve of our English stations for periods varying from ten to three years. The stations examined have been Shields, York, Nottingham, Liverpool, Hurst, Scilly, Dover, London, Oxford, Cambridge, Yarmouth, and Jersey. At all these stations, excepting Liverpool and Jersey, with very low gradients (viz. from ·001 to ·005 inch for fifteen miles), mean estimated wind forces from points between north-north-west and south-east, inclusive, have been higher than those from points between south-south-east and north-west inclusive. With the higher gradients we necessarily find results opposed to this in the cases of stations having a good exposure on the west or south and a bad exposure on the north or east, just as, on the other hand, we find the result above mentioned unduly heightened at stations which have only a good east or north exposure. If however we take stations whose exposure, though not unexceptionable, seems tolerably fair, we find that with somewhat steep as well as with low gradients, north and east winds accompanying any given amount of gradient have a higher estimation than south and west winds accompanying the same. The following table shows results at which I have arrived from an examination of the reports from three stations, viz. the two inland stations of Nottingham and London and the one sea station of St. Mary's, Scilly, which last, while very well exposed to all winds, is perhaps most perfectly so to those from the Atlantic.

	Gradient in inches per fifteen nautical miles.	Mean estimated force of equatorial winds (Beaufort scale).	Corresponding approximate velocity (miles per hour).	Mean estimated force of polar winds (Beaufort scale).	Corresponding approximate velocity (miles per hour).
Nottingham	·001 to ·005	0·43	5·2	1·06	8·3
	·005 to ·010	1·88	12·4	2·26	14·3
	·010 to ·015	2·99	17·9	4·06	23·3
	·015 to ·020	3·64	21·2	4·61	26·0
	·020 to ·025	4·41	25·0	5·35	29·9
London	·001 to ·005	0·91	7·5	1·31	9·5
	·005 to ·010	1·45	10·2	2·00	13·0
	·010 to ·015	2·24	14·2	2·93	17·6
	·015 to ·020	3·01	18·0	4·18	23·9
	·020 to ·025	3·64	21·2	4·85	27·2
Scilly	·001 to ·005	2·42	15·1	2·49	15·4
	·005 to ·010	4·24	24·2	4·86	27·3
	·010 to ·015	5·45	30·5	5·68	31·7
	·015 to ·020	6·40	36·4	6·49	36·9

The suggestion which I offer in explanation of this difference of force in the two classes of winds is made with some diffidence, since it involves a hydrodynamical question, the solution of which is somewhat difficult. Since the atmosphere is of greatest density near the poles, while barometric pressure is less near the poles than over the tropics, the pole-ward, and, under the effects of the earth's rotation, eastward movements of the atmosphere, at any given considerable altitude above the earth's surface, must necessarily greatly exceed the corresponding movements at the surface of the earth. "The planes of equal pressure receive," in short, "an ellipsoidal form, the major axis of which is perpendicular to the axis of the earth."[1] Thus the polar areas of low pressure must be far more permanent and far better marked in the upper than in the lower regions of the atmosphere; consequently gradients for westerly winds when occurring at the earth's surface must commonly extend into the higher regions of the atmosphere; while gradients for easterly winds must, on the contrary, be usually accompanied by gradients for westerly winds at no great distance above them. Observations of the movements of the upper clouds, and also of the winds experienced at the summits

[1] Sprung, "Studien über den Wind und seine Beziehungen zum Luftdruck," ii. p. 6.

[1] Hann, "Zeitschrift der österreich. Ges. für Meteorologie," vol. xiv. p. 35.